Silver impact on *Staphyloccocus epidermidis* adhesion to Ag-TiCN coatings

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The failure of medical devices occurs among other factors by microbial infection that can happen at the time of placing in the surgery or during a subsequent infection caused by diseases. S*taphylococcus epidermidis* have emerged as one of the major nosocomial pathogens associated with these infections. The initial adhesion of these organisms to biomaterials' surface is thought to be an important stage in their colonization.

The aim of this work is to develop surfaces that are able to prevent microbial colonization. Thus, the present work explores the potentialities of silver-containing carbonitride-based (Ag-TiCN) thin films. The Ag-TiCN coatings were deposited onto stainless steel 316L, by DC reactive magnetron sputtering using two targets, Ti and Ti+Ag, in an Ar + C_2H_2 + N_2 atmosphere. Silver pellets were placed in the area of erosion of Ti target in order to obtain a silver content up to 20 at. %. Compositional analysis was achieved by Electron Probe Microanalysis (EPMA).

Morphology and topography analysis were achieved by Scanning Electron Microscopy (SEM) and Atomic Force Microscopy (AFM) respectively. With the increase on the Ag content, the coatings show a more dense morphology. It is also observed a decrease on the roughness of the films from 47 nm for the sample without Ag to 7 nm with 20 at. % Ag content. Superficial tension of coatings was measured and the results show that with the increase on the silver content onto coatings promote an increase in hydrophobicity.

Bacterial adhesion and biofilm formation on coatings were assessed by enumeration of colony forming units (CFUs) in order to assess the number of viable cells. The results showed that the surface with the lowest roughness and highest hydrophobicity leads to greater bacterial adhesion and biofilm formation, highlighting that surface morphology and hydrophobicity rule materials colonization. Additionally, SEM was also used to observe the bacteria adhesion and biofilm formation confirming the above results.

Keywords: Sputtering; microorganisms' adhesion; biofilm; hydrophobicity; biomaterial